Electronic Version

Stylesheet Version v1.1.1

Description

HELI-SHAFT

BACKGROUND OF INVENTION

[0001] The present invention relates to intake and exhaust valve assemblies, related ignition systems and intake and exhaust manifolds for internal combustion engines.

[0002] Internal combustion engines typically employ poppet type valves combined with a distributed runner intake manifold system for air/fuel intake delivery to the combustion chamber(s). Additionally exhaust gases are generally expelled through poppet type valves combined with a collective runner exhaust manifold system for exhaust handling and discharge.

[0003] The operating cycle of an internal combustion engine consisting of four phases in the four-stroke model is comprised of an intake phase, compression phase, ignition to achieve an expansion or power phase, and an exhaust phase; this requires one turn of the camshaft(s) and two turns of the crankshaft. Current engine head designs used in automotive and marine applications are generally

based upon this common design principle for delivery to the combustion chambers air/fuel for intake, provide combustion chamber shutoff to achieve air/fuel mixture compression, introduce an ignition device for the expansion or power and provide an outlet for exhaust gases. While many variations based upon this common theme do exist the fundamental approach is consistent.

[0004] Current engine valve train designs typically contain most or all of the following components: camshaft(s), linear poppet valves, valve springs, valve retainers, rockers, lifters, and pushrods; while the current internal combustion engine has a very reliable valve train design, it does require a considerable amount of energy during operation to overcome the mechanical resistance inherent to its design. Moreover, additional complexities and refinements made to this design increasingly achieve less significant gains due to the aggregate effect of many components nearing their physical design limits.

[0005] The HELI-SHAFT intake and exhaust manifold system is designed to improve overall engine performance and reliability offering adaptability to both existing engine designs either as a retrofit or as a complete integrated original equipment manufacturing solution. Central to this de-

sign is a less restrictive and more efficient intake and exhaust manifold system. By significantly reducing the energy required to drive the system as compared to conventional valve head assemblies, more usable horsepower is ultimately available for use by the drive train of a vehicle. In addition, by improving the power to weight ratio of the internal combustion engine, broader more flexible design options are available.

SUMMARY OF INVENTION

[0006] The HELI-SHAFT design provides a unique method of air/fuel delivery and exhaust with much fewer individual components, presents a very low mechanical resistance profile during operation and also incorporates an advanced integrated ignition system. Additionally this design provides an ideal platform for both existing and future adaptation of performance enhancing components such as turbo charging, super charging, direct injection fuel delivery and advancing computer controlled engine management systems.

[0007] The initial design is based upon adaptation to an existing standard V8 engine configuration. Air/fuel delivery is directed to each bank of four cylinders via two belt driven overhead rotating sleeved shafts incorporating a helical

type cutout or internal runner along the length of each shaft specifically designed to match the firing order of the engine. These shafts are driven by the crankshaft at a ratio of two turns of the crankshaft equaling one turn of the HELI-SHAFT. Port openings are provided in the surrounding sleeve(s) and registered or timed to align with each of the four cylinders during the intake phase. Parallel to the intake runner is an offset exhaust runner positioned to allow timed alignment with corresponding exhaust port openings in the sleeve(s) providing an opening during the exhaust phase of each cylinder.

[0008] The intake runner in each shaft is filled in the front of the engine by a common intake plenum and air/fuel mixture is drawn in through vacuum created by each cylinder during the intake phase. Similarly, exhaust gases are pushed out the back of the engine through the exhaust runner into a common exhaust system.

[0009] A Fixed or conventional spark plug mounting design may be used with this system, or for more desirable results, spark plugs can be incorporated into the rotating shafts positioned in a manner consistent with ignition timing for each individual cylinder. As each spark plug rotates into position the center electrode charge is provided during

the power phase. This spark plug configuration allows the spark plug to be placed directly down the centerline of the piston creating an even combustion pressure across the piston surface. Compression is achieved as the sleeved shaft rotates to a solid surface in between the intake port opening and the spark plug electrode.

DETAILED DESCRIPTION

[0010] The HELI-SHAFT is comprised of a shaft with two helical and parallel runners cutout along its length. These runners provide both air/fuel intake and exhaust outlet. The intake runner has an opening at the front end of the shaft to provide an inlet for the air/fuel mixture to enter from the intake plenum. At the end of the exhaust runner is an outlet for the exhaust gases to exit the back of the shaft. The shaft provides locations for spark plugs to be inserted and is fitted with a sleeve of the same length to enclose the dual runner system. The sleeve contains port openings located over each intake and exhaust runner positioned to provide alignment with individual engine cylinders matching both the firing order and cycle timing of the engine. At the front or intake end of the shaft extends a mounting hub for attaching a V-groove drive pulley. The HELI-SHAFT drive pulley(s) are connected to the crankshaft with

a V-groove belt and rotate one half the speed of the crankshaft during operation.

[0011] The engine head itself is split into two half's providing a clearance channel for the sleeved shaft assembly. Split bearing block inserts mount in the base half and provide a through port opening above each combustion chamber. Self lubricating bearings with ports aligned with the base bearing block insert ports are placed in the bearing blocks and the shaft is inserted through the center of each. The top bearing block inserts and compression seals are enclosed with the top half of the head providing a cover for the assembly.